

Solar energy!



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Introduction

Our energy project is about Solar Energy. There are three different ways of solar energy:

- Solar water heating
- Solar furnaces
- Solar panels.

Solar energy uses the energy from the sun to make warm water or electricity. We will take a look at: how it works, the advantages and disadvantages and a lot more!

We hope you enjoy reading our paper about solar energy!



How does it work?

You know that there are three ways of solar energy and we are going to explain them all.

Solar furnaces

Solar furnaces are actually an array of mirrors or a curved mirror that concentrate light into a point (called focal point). The focal point can reach 3500°C (6330°F or 3773K). This heat can be used to generate electricity or you can do other things with the heat (like melting iron). There are smaller versions of solar furnaces: solar cookers- a solar cooker is used in countries with a lot of sun. It is actually exactly the same but then smaller, a solar cooker is used for making tea or warming up liquids.

Solar cells

The solar cells that are in a solar panel are called Photovoltaic Cells- (photo means light and voltaic means electricity). Photovoltaic cells convert sunlight direct into electricity. But how does that work?

Photovoltaic cells are made of special materials called semiconductors. Semiconductors are in between conductors.

They conduct but they don't do it as well as the conductors do. The semiconductor that is mostly used in photovoltaic cells are silicon. When light strikes the photovoltaic cells the semiconductor absorbs a small portion, this means that the energy of the absorbed light is transferred to the semiconductor.

Photovoltaic cells have one or more electric field(s) and that acts to force the electrons that are freed by the light absorption to flow in a certain direction- this flow is called a current. When you place metal contacts on the top and the bottom of a photovoltaic cells you can measure that current. This current together with the cells voltage (how many electric field(s) there are) defines the power that the solar cell can produce.

Solar water heating:

There is water in tubes and that water is heated up by the sun's radiation, the water is in tubes that are in the solar collector. On top of the solar collector is glass, then just below the glass are the tubes. In the tubes is the water that is being heated up. Beneath the tubes is an absorbing plate, that plate absorbs the sun's radiation and it has most of the time a black surface.

Below the absorbing plate is insulation to take care off that no heat is lost.

In the frame are two parts where the water can get in and out. On one side there is the coolant inlet, that's where the cold water is coming in to be warmed up.

On the other side is the coolant outlet, that's where the warm water is coming out.

The heated up water goes to a tank.

The tubes with warm water go through the lowest part tank, without letting water out.

They go through the lowest part of the tank because in the tank there is also water, on the bottom cold but on the top warm because the tubes warm up the cold water, then convection takes place and the water goes up.

Then at the part where the warm water is, is a tube that goes to the warm water tap. Also there is another tube inside the tank, that tube is from the boiler because when the sun doesn't provide enough heat the boiler starts working.

The boiler heats the water with electricity. That happens most of the time when the sun isn't shining very strong.

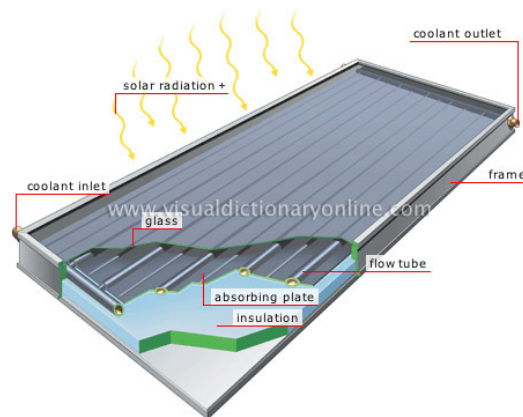
There is also another way of warming up water and that is that the tubes with the warm water end in the boiler and the colder water (on the bottom of the tank) goes back in the tubes again while the warm water stays on top.

There are two ways of solar water heating: active and passive.

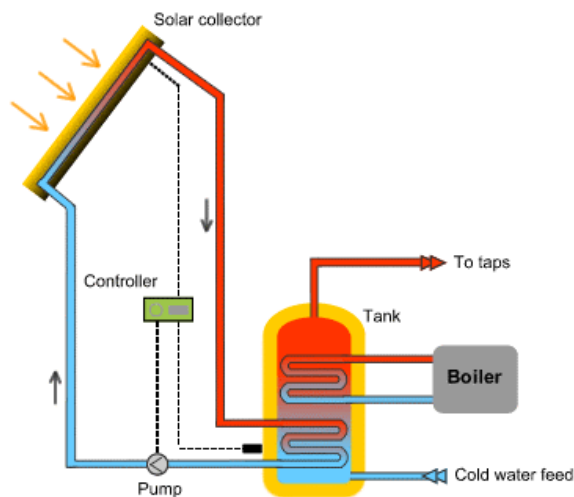
Active is solar water heating but then with a pump in it. The pump circulates the water around so then you can place the tank wherever you want (with passive you can't do that).

Passive is also solar water heating but then convection circulates the water around, the only thing that you have to do is to put the tank next to the collector.

The picture below is a solar water heater, you can see the parts of it.



The picture below is about the whole water heating process altogether.



Where can you find it and why?

You can find it everywhere in the world where the sun is shining for the main part of the day, because the only thing solar energy needs is the sun.

But in the poles the sun isn't shining for the main part of the day, so solar energy isn't very effective there and it would probably cost more than it would earn.

The biggest plants of it in the world are in;

- . Deming, New Mexico, USA
- . Gila Bend, Arizona, USA
- . Mildura, Victoria, Australia
- . Fresno, California, USA
- . Brandis, Rhineland-Palatinate, Germany
- . Jumilla, Murcia, Spain
- . Beneixama, Alicante, Spain
- . Sinan, Jeollanam-do, South Korea
- . Las Vegas, Nevada, USA
- . Salamanca, Salamanca, Spain
- . Lobosillo, Murcia, Spain
- . Arnstein, Bavaria, Germany
- . Serpa, Alentejo, Portugal

This doesn't mean that there are no plants in other countries as well, only that the biggest plants are in that countries.

You can see that most of them are in Spain or in the USA, that is because in those countries the sun is shining the most part of the day and is the strongest there.



Can it be used in Spain and in the Netherlands?

It can be used in Spain, because there are already big plants of it in Spain.

In Spain they can use the three ways of it, solar water heating, solar panels and solar furnaces. The people in Spain use it also a lot and the plants give energy to some cities in Spain. So the solar energy can definitely be used in Spain.

It can be used in the Netherlands because the sun shines as well and some people of the Netherlands have solar water heating or solar panels.

Only the Netherlands don't have big plants of solar energy because the sun in our country has most of the time not enough power to work on a solar plant. The sun works on the solar panels and solar water heaters that are placed at the houses.

There are no solar furnaces in the Netherlands because solar furnaces need direct radiation from the sun and not the radiation that comes through the clouds like in the Netherlands.

Solar plants are used for giving a town/area electricity and solar panels/solar water heaters are used for giving your own house electricity or warm water.



Is it expensive?

It is expensive to get solar panels or solar water heaters and it gets more expensive when you want to have more watts. Watt is the amount of electricity that can be made.

It is so expensive because building the solar plants is expensive. But the prices are getting lower because the technology improves.

Has it an effect on the environment?

When it is build it doesn't affect the environment anymore because it only needs the energy from the sun.

The only effect it has, is the building of the solar plants and putting the solar panels/water heaters on the roof or making the solar furnaces.

That could affect the environment because you need machines to do that and the machines effect the greenhouse effect. It also effects the environment because you can see them (at the roofs).

It has no effect on the people- the solar plants itself. The making, as we said does have an effect.

Are you dependent on other people or countries?

You aren't dependent on other people/countries when you want to generate electricity because you only need the sun to make the electricity.

Once you've made the solar plant, the plant does work by itself, you don't have to control anything. Only sometimes it needs to be checked if its working good enough.

How many energy is generated in one plant?

You have different ways of solar energy and they don't all give electricity, only solar furnaces and solar panels do that.

The energy in a solar panel

The amount of energy generated in one plant differences because the plant can difference in size.

You can know how much energy one panel gives because almost all panels are the same.

The electricity one 200 watt panel gives is 200 watts of electricity per hour of direct sunlight. You need 20 watt to light a light bulb.

The energy in a solar furnace

The sun's beams are pointed at a collector and a collector turns the sun beams into electricity.

One solar furnace can give 14 till 80 megawatts, depending on how many degrees the sun is shining that day.

The advantages of solar power are:

- It is renewable, we can use it always when the sun is shining.
- Solar energy costs nothing, the energy itself is free, you only need to invest some money to get it.
- The solar cells don't cost much maintenance when they are brought up to their maximum efficiency.
- The solar cells are very quiet when they 'collect' sunlight. They don't make any noise like other energy sources.
- Solar panels are very reliable; they can last longer than any other energy sources because they have parts fixed and not moving.

The disadvantages are:

- It is expensive to build (the solar plants and the solar panels, solar water heating and solar furnaces).
- It only works when the sun is shining or when the sun is shining on the solar plants/panels/water heating/furnaces. At night the solar power doesn't work or when the power is in the shade.
- It requires a lot of space- the solar building, power plants; they need a lot of space to make enough energy.

Sustainable yes or no?

It is sustainable because we don't know when the sun will disappear. Also you can use the sun over and over again because after one time using the sun, it isn't gone.

Conclusion

It was interesting to talk about Solar energy because you think that you know a lot about it but we discovered that that wasn't true. We learned a lot about how it works or what the advantages and disadvantages are. The main advantage is that the sun doesn't disappear (maybe in about 5 million years) and that you can use solar energy always when the sun is shining.

